Ballistic Imaging and Comparison Of Crime Gun Evidence By the Bureau of Alcohol, Tobacco and Firearms

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I. Preface

This report was prepared at the request of the California Department of Justice; the Department requested ATF's response to its publication "Technical Evaluation: Feasibility of a Ballistics Imaging Database for All New Handgun Sales" (hereafter the "Evaluation"). ATF's response will describe its use of IBIS technology for the NIBIN program, and will discuss the technical issues raised in the report as they relate to the crime gun system deployed by ATF.

Through its National Integrated Ballistic Information Network (NIBIN) Program, the Bureau of Alcohol, Tobacco and Firearms (ATF) deploys Integrated Ballistic Identification System (IBIS) equipment into State and local law enforcement agencies for their use in imaging and comparing crime gun evidence. Undertaking the initial comparison of crime gun evidence through automated comparison of digital images enables examiners to find potential links between crimes not previously known to be related; when correlation of a new piece of evidence indicates the potential for a match, examiners undertake the microscopic comparison of original evidence and confirm the match. The resulting "hit" provides a valuable lead to investigators. Numerous violent crimes involving firearms have been solved through use of the system, many of which would not have been solved without it.

The NIBIN program is currently engaged in the second year of a multi-year expansion. When the deployment is complete in all 16 multi-state regions, IBIS technology will be available at approximately 233 sites, covering every State in the Union and in all major population centers. NIBIN represents the joining together of two Federal programs deploying ballistic imaging equipment, as ATF and the Federal Bureau of Investigation (FBI) agreed to work together to deploy IBIS technology nationwide. IBIS equipment was selected for purchase based on assessment of its functionality for the envisioned tasks, and ATF has found that the IBIS equipment manufactured by Forensic Technology, Incorporated (FTI) has proved appropriate and effective for this purpose.

It is important to note that the intended function of the system to be deployed by the California Department of Justice is significantly different. Other factors specifically relevant to the deployment of ballistic equipment for uses other than collecting crime gun evidence are not addressed in this report.

It should also be noted that because of ATF's status as a Federal agency, it cannot endorse a specific provider of a service or instruct other Federal, State or local agencies to purchase ballistic imaging equipment from a particular vendor, and should not be perceived as doing so. Each agency must weigh the capabilities of the ballistic imaging equipment available and make its own choices.

Table of Contents

II. Executive Summary

Firearms examination is a sub-specialty of toolmark examination, the purpose of which is first to identify the tool used in the commission of a crime and then to link a suspect to the crime scene. The fundamental premise of firearms examination is that the toolmarks created on bullets and cartridge casings during the firing process are unique (that no two firearms leave the same markings on bullets and cartridge casings) and reproducible (that successive firings of a given firearm will produce identical markings). In addition to being able to confirm links between crimes already thought to be related, firearms examiners have long sought to discover links between crimes not already connected. To this end, it has been common practice to maintain an "open-case file" of physical evidence from unsolved crimes, sorted by caliber. Automated ballistic imaging and comparison takes this process one step further by making a systematic initial comparison of evidence entered in previous cases and highlighting for further examination any evidence that has the potential to match. The IBIS system is not intended to make identifications on its own; the expertise of a firearms examiner, examining the original evidence, is mandatory in order to make an identification that is actionable by law enforcement authorities.

Through its NIBIN Program, ATF deploys IBIS equipment into State and local law enforcement agencies for their use in imaging and comparing crime gun evidence. In funding and supporting this program, Congress intended to provide State and local law enforcement agencies with an effective intelligence tool that many could not afford on their own. The system also makes it possible to share intelligence across jurisdictional boundaries, enabling Federal, State and local law enforcement agencies to work together to stop violent criminals. ATF complies with all applicable restrictions imposed by Congress; for example, the NIBIN program is expressly restricted to the ballistic imaging of data associated with crime guns. NIBIN, therefore, is a crime-fighting tool, and not in any way a firearms registration system.

The ATF report describes the history of NIBIN since its beginnings as the Ceasefire program in 1992. ATF is the sole agency manager of NIBIN, and provides networking of the systems as well as purchase and deployment of systems and training of users. A two-year nationwide deployment is currently in progress, in which 160 sites have received IBIS equipment. When the network is completed, approximately 233 sites will be included.

The statistical and anecdotal evidence that the NIBIN Program is succeeding in helping State and local law enforcement agencies to fight violent crime is described in detail in the ATF report. Statistics on hits are given, as well as summaries of some success stories from State and local NIBIN partner agencies.

The Evaluation describes a number of experiments conducted in order to assess the effectiveness of the IBIS system; in these experiments, Federal brand ammunition was used for testfiring and IBIS entry. The choice of Federal brand ammunition for these experiments, while logistically convenient, was not scientifically optimal, and may have skewed the results of the experiments. Firearms examiners have long known that the toolmarks left by firearms on bullets and cartridge casings are best reproduced (and thus most visible) on ammunition of

intermediate hardness—neither too hard, and thus too difficult to mark, nor too soft and too easily marked. Through use of and research using the IBIS system, ATF has developed and published protocols for the optimal ammunition for each caliber; Federal brand is not included in these protocols, due to its comparative hardness and thus the sub-optimal visibility of marks on bullets and cartridge casings. The results of the experiments conducted for the Evaluation indicate the IBIS system to be relatively ineffective in discovering potential matches later verified by a firearms examiner as "hits," yet this has not been ATF's experience with the system, and it does not match the conclusions of the extensive research conducted in the past on the effectiveness of IBIS. The choice of ammunition used for the experiments may partially explain this divergence in results.

The Evaluation raises a number of technical issues about the IBIS system's operation; in discussing them, the ATF report relates specifically to ATF's use of the IBIS system for the imaging and comparison of crime gun evidence through the NIBIN Program. For organizational purposes, these technical issues raised have been grouped into four categories:

- issues relating to firearms,
- issues relating to ammunition,
- correlation and database issues, and
- other issues.

In the area of issues relating to firearms, some inaccuracies in the Evaluation regarding which types of firearms can be imaged into IBIS are resolved, and ATF laboratories' entry of firearms evidence from a variety of firearms is described. The Evaluation also extensively discusses the possibility that firearms may be altered in order to disguise their signature; the ATF report relates this extremely infrequent occurrence to the overwhelming majority of cases in which no alteration takes place and firearms identification, by automated system and then by examiner comparison, is effective.

One key topic in the area of issues relating to ammunition, the choice of ammunition for the Evaluation's assessment experiments, has been discussed above. Also in this section, the Evaluation uses hit data from an individual laboratory to draw inappropriate conclusions about the relative utility of imaging bullets; the ATF report describes the laboratory protocols that may also adversely impact the bullet hit rate at that laboratory, and describes the successes that ATF has experienced through consistently imaging both bullets and cartridge casings. The Evaluation also predicts that subclass characteristics common to a group of firearms will negate the effectiveness of automated ballistic comparison and of firearms examination; the ATF report provides perspective on ATF's experience in using IBIS to identify individual matches despite common characteristics, and delineates past research conducted by firearms examiners on this topic.

ATF's report also includes a section relating to correlation and database issues. After projecting the size of the California database, the Evaluation predicts a potential correlation time for each image; the ATF report describes the advances in IBIS technology from its inception to the present and the time currently required for correlation of images (considerably smaller than that cited in the Evaluation), and discusses the importance of correlation time in a forensic laboratory's operations. The Evaluation also reaches a number

of conclusions about how a large database with many similar images will operate; the ATF report describes the behavior of databases at ATF laboratories. These databases, though sizable and made up of large numbers of similar images, do not experience the correlation problems predicted in the Evaluation. Also, the Evaluation notes the central importance of database security to any system's operation. The ATF report describes the legal and network considerations which led ATF to refuse the California Department of Justice's request to conduct some of the experiments for the Evaluation by inserting research images into the working crime gun database for the California region. This could have been a violation of ATF's appropriations restrictions, and would have required permission from every agency on the server as well as authorization from ATF.

A number of other issues were addressed in the Evaluation, and are discussed in the ATF report. The Evaluation does not accurately state the types of personnel needed to utilize IBIS equipment effectively, and the ATF report describes utilization of technicians as IBIS operators at ATF laboratories and NIBIN partner laboratories nationwide. The Evaluation predicts the unfavorable impact of training IBIS operators to look only at the top 10 images. Noting the potential for changing this guidance if it should become problematic in the future, the ATF report describes the alternate examination technique taught simultaneously with the top-10 guidance, and the reviewer's option of viewing additional images. The Evaluation also does not accurately define the term "hit," a vital concept for understanding and assessing the system. The ATF NIBIN Program definition of "hit" is included, and the importance of examiner comparison of original evidence in order to declare a hit is emphasized. The Evaluation extensively reviews the restrictions that would be necessary for a database of evidence and the restrictions to law enforcement action on potential high-confidence candidates; the ATF report notes that in ATF's NIBIN Program, all images entered are evidence, evidentiary protocols are already followed, and no information is acted on until a hit is confirmed by a firearms examiner. Finally, the Evaluation repeatedly draws distinctions between firearms evidence and fingerprint evidence, concluding that the variability of firearms evidence makes it inferior. Yet there are striking parallels between ballistic evidence and fingerprint evidence—in potential for alteration, individuality within general categories, and necessity of comparison by a trained examiner to verify a match—and these are delineated in the ATF report.

For several years, ATF has utilized IBIS automated ballistic comparison equipment in its firearms laboratories, and has deployed it into State and local NIBIN partner agencies in order to assist them in their efforts against violent crime. Statistics on hits generated, as well as stories of crimes solved, illustrate that these agencies—and the law-abiding Americans resident in their jurisdictions—have benefited from ATF's NIBIN Program. Though no investigative tool is perfect or will be effective in every situation, the availability of an "open-case file" of many thousands of exhibits, searchable in minutes instead of the lifetimes that would be required for an entirely manual search, provides invaluable information to law enforcement authorities.

III. The Examination of Firearms Evidence

Firearms examination is a sub-specialty of toolmark examination, the purpose of which is first to identify the tool used in the commission of a crime and then to link a suspect to the crime scene. This identification is possible because a tool leaves scratches, depressions and other markings on an object with which it comes into contact. Through examination of these markings, it is possible both to determine general characteristics (for firearms, parameters such as the caliber of the weapon used) and to make a precise identification (to link the evidence to an individual firearm). The ability to place a specific firearm at the scene is vital to law enforcement, because information about the weapon can be of use in identifying a suspect or confirming an individual's connection to a crime.

In order to become qualified as firearms examiners, trainees undergo a two-year formal training program in which they receive instruction on specific subjects and work with the supervision and guidance of a qualified and experienced firearms examiner. (ATF's National Firearms Examiner Academy and the program administered by the Association of Firearms and Toolmark Examiners (AFTE) are examples of such programs.) As trainees move through successive areas of the program, they are tested for competency, and gradually begin doing less difficult casework under the direct supervision of an examiner. As the trainee's skill increases, so does the level of case complexity and the autonomy offered. Casework performed by any examiner (trainee or senior examiner) may undergo peer review by another examiner.

The fundamental premise of firearms examination is that the toolmarks created on bullets and cartridge casings during the firing process are unique (that no two firearms leave the same markings on bullets and cartridge casings) and reproducible (that successive firings of a given firearm will produce identical markings). Exhaustive academic research has reinforced this statement, as described in the articles listed below and in many others. Marks on firearms evidence have been shown to be consistent through hundreds or thousands of firings. Because markings on bullets and cartridge casings are made by different parts of a given firearm, it is not possible to link a bullet from one crime scene to a casing from another; matches must be made bullet to bullet and casing to casing. It has also been demonstrated that even consecutively made firearms from the same manufacturer, that underwent the same manufacturing processes, can be distinguished from each other.

There are exceptions to the uniqueness and reproducibility of markings by firearms, and they too have been studied extensively, to delineate their frequency of occurrence and their potential effect. (As the Evaluation cited many of these issues in its discussion of the desirability of automated comparison using IBIS, they will be discussed individually in detail in the "Technical Issues" section of this report.) Depending on the degree of their presence, the impact of these factors range from minor distractions to major impediments to identification by a firearms examiner.

Factors related to uniqueness that can complicate the identification process include the presence of "subclass characteristics," or, markings common to groups of firearms or ammunition that can be mistaken (by machine or examiner) for markings individual to a firearm. The firearms examiner community has conducted extensive research on this issue, as described in the articles listed below.

Factors affecting the reproducibility aspect include the condition of the weapon and any attempts made to alter it. In some cases, the buildup of dirt and debris can have minor impact on the markings made on ammunition, though this does not necessarily lessen the markings and can in fact magnify them. It is also possible, using a file or other implement, to attempt to alter a firearm so that the bullets and cartridge casings expelled from it have a different appearance. Because of the microscopic character of the changes, it is not possible to alter one firearm in order to make the imprint look like another; rather, the idea of altering a firearm would be to prevent a definitive identification by creating additional markings for examiners or automated equipment to read.

It is important to note that while it is not particularly difficult or time-consuming to alter a weapon (as the Evaluation notes in section 1.2), instances of this occurring in actual casework are exceedingly rare. One of the senior ATF firearms examiners collaborating on this report has seen only two cases of altered firearms over the course of a 15-year career, and in one of those two cases, the diversion was unsuccessful, as the evidence could still be matched to the firearm despite the alteration. Also, because the altered version of the imprints are consistent until changed again, the gun will leave the new markings consistently unless it is re-altered after every use; thus, in a crime gun database, the new markings are useful as well.

In addition to being able to confirm links between crimes already thought to be related, firearms examiners have long sought to discover links between crimes not already connected. To this end, it has been common practice for firearms examiners to maintain an "open-case file" of physical evidence from unsolved crimes, sorted by caliber. When faced with a crime on which little evidence was available, the examiners would then go to the storage area for evidence from unsolved cases and choose some potentially similar cases for examination of originals. (Operation of such an open-case file is discussed in the article listed at the end of this section.) Because of the time required to execute a manual comparison of evidence, the effectiveness of this method can be severely limited by the staffing and workload of an agency's examiners (which determines how much time examiners have to search the open-case file).

In a sense, IBIS is an automated version of this open-case file. Automated ballistic imaging and comparison takes this process one step further by making a systematic initial comparison of evidence entered in previous cases and highlighting for further examination any evidence that has the potential to match. Numerical scores are returned indicating the similarities between the newly entered evidence and previous records. An examiner reviews results, then makes a manual comparison between evidence in cases that the examiner believes have the potential to match. The IBIS system is not intended to make identifications on its own; the expertise of a firearms examiner, examining the original evidence, is mandatory in order to make an identification that is actionable by law enforcement authorities.

Through NIBIN, large-scale ballistic comparison goes from an impossibility to a valuable investigative tool. For example, the NIBIN database of the New York Police Department contains 79,351 entries (as of January 31, 2002). When evidence from a new crime comes into police custody, it can be compared using NIBIN to all previous evidence acquired, a task that would take an individual firearms examiner an entire career to undertake in order to solve a single crime. This task would never be attempted without ballistic imaging, and the crime would go unsolved. Now such a comparison can take place in minutes, revealing potential links between crimes and creating leads not available from any other source. The use of NIBIN does not remove the human element from ballistic comparison; instead, it makes the firearms examiner more powerful by focusing attention on potential matches.

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IV. ATF's NIBIN Program

Through its National Integrated Ballistic Information Network (NIBIN) Program, ATF deploys Integrated Ballistics Identification System (IBIS) equipment into State and local law enforcement agencies for their use in imaging and comparing crime gun evidence. This equipment allows firearms technicians to acquire digital images of the markings made by a firearm on bullets and cartridge casings; the images then undergo automated comparison. By minimizing the amount of non-matching evidence that firearms examiners must inspect in order to discover a match, the NIBIN system enables law enforcement agencies to discover links between crimes more quickly, and to discover links that would have been lost without the technology. In funding and supporting this program, ATF provides State and local law enforcement agencies with an effective intelligence tool that many could not afford on their own. The system also makes it possible to share intelligence across jurisdictional boundaries, enabling State and local law enforcement agencies to work together to stop violent criminals.

As with other programs, ATF complies with all applicable recordkeeping restrictions imposed by Congress. For example, the NIBIN program is expressly restricted to the ballistic imaging of data associated with crime guns. In addition, ATF ensures that our NIBIN partners are also aware of and comply with ATF's restrictions. Accordingly, ballistic systems deployed by ATF to Federal, State or local authorities cannot be used to capture or store ballistic images acquired at the point of manufacture, importation or sale, or any other data associated with such images, including information about the purchaser, the firearm type, model, caliber or gauge, the serial number, or the date of manufacture.

The NIBIN program began in 1992 as Operation Ceasefire, an enforcement program to address firearms-related violence. Early program plans called for entering into a national computer system all data obtained from firearms seized as a result of a criminal investigation by ATF personnel. ATF intended to allow State and local law enforcement agencies to use and retrieve information for investigative purposes, and to submit information from their own firearms-related criminal investigations. The next year, Forensic Technology, Incorporated (FTI) demonstrated to ATF its "Bulletproof" system for the collection and comparison of digital images of bullets, and ATF instituted a pilot project using the new technology in its laboratories.

At the request of the Office of Management and Budget, the Office of National Drug Control and Police Counterdrug Technology Assessment Center organized an independent evaluation of the Bulletproof system being used by ATF and the Drugfire system being used by the FBI. Both ballistic imaging systems use computer-searching capabilities to match recovered crime scene evidence against information stored in a computer database; at the time of evaluation, Bulletproof handled only bullets, and Drugfire only cartridge casings. The project considered system performance and life cycle cost, redundancy, and potential for integration. It found that processing casings and projectiles on a common versatile platform would best fulfill ballistic imaging requirements. (This recommendation that bullets and cartridge casings be handled by one common system is mentioned in section 2.3 of the Evaluation.) As a result of these recommendations, FTI developed Brasscatcher. This development provided a platform

that could evaluate both projectiles and cartridge casings. FTI referred to the new system it developed as the "Integrated Ballistics Identification System (IBIS)." IBIS was comprised of Bulletproof and Brasscatcher. A system modification to the Drugfire system which would have allowed it to handle bullet evidence was not completed until two years after the appearance of Brasscatcher.

After two and a half years of study by the National Institute of Standards and Technology, it was determined that direct data exchange between IBIS and Drugfire systems was not feasible, and so an alternate solution was pursued. ATF and the FBI negotiated a series of memoranda of understanding to merge the two programs; in the last, signed in December 1999, ATF agreed to be responsible for field operations, including purchase of equipment and training of users, and the FBI for providing a communications network. ATF and the FBI agreed that the IBIS platform would be the primary ballistic technology deployed for use by State and local law enforcement.

In early 2000, ATF completed its strategic plan to support the rollout. The plan included the creation and staffing of the NIBIN Branch to support NIBIN field operations, the initial stages of development of regional servers capable of correlating and storing more data and of communicating with more sites than under the previous hub configuration, and notional decisions on which State and local law enforcement agencies would be offered IBIS equipment and on the order of the deployment. Criteria used to evaluate agencies for participation in the program included population served, firearms-related crime rate, and number of firearms recoveries, as well as age, condition, and usage of existing systems.

ATF has since become the sole agency manager of NIBIN, and funds networking of the systems as well as purchase and deployment of systems and training of users. A two-year nationwide deployment is currently in progress, in which 160 sites have received IBIS equipment. When the network is completed, approximately 233 sites will be included.

Agencies may become part of the NIBIN program in two ways: through inclusion on the tentative deployment list or by nomination. The plan created in early 2000 has served as a basis for the national deployment currently in progress. Also, additional law enforcement agencies have requested to participate in the program, and are included as deployment proceeds in their regions.

During the evaluation of a prospective NIBIN partner agency for participation in the program, ATF personnel conduct a site visit, meeting with upper management and laboratory personnel. At this meeting, each agency's responsibilities under the program are discussed, and agency representatives receive a copy of the mandatory Memorandum of Understanding (MOU) between ATF and the partner agency. This MOU must be signed before ATF can deploy any equipment. In signing the MOU, the partner agency agrees to enter crime gun evidence and agrees to abide by ATF's regulations for use of the machines on the ATF NIBIN network. A "footprint" describing the technical requirements of the equipment is also provided.

Though equipment, networking and training are all provided by ATF, an agency must commit its own resources to the NIBIN program to gain maximum benefit from it. Agencies joining NIBIN must commit to maintaining adequate staff to support the program, and will need a comparison microscope and access to a bullet recovery system to testfire firearms. Agencies receiving a Remote Data Acquisition Station (RDAS) must have a firearms examiner available to evaluate correlation results; in some labs it is helpful to have trained technicians make entries into the IBIS system, freeing examiners to review results and confirm hits by examination of the original evidence. Building the NIBIN database requires committing human resources as well as educating law enforcement customers on the importance of resubmitting shooting evidence for inclusion and search against the database. Partner agencies must commit to entering as much crime gun evidence into the unit as possible, and to sharing intelligence information and evidence with other law enforcement agencies.

ATF owns and regulates the frame relay network over which NIBIN equipment communicates. The network includes ATF-owned equipment that is operated by State and local law enforcement personnel, as well as a few units owned by States and operated over the ATF network. Before agencies gain access to the network, by connecting agency-owned equipment or by receiving ATF-owned equipment, each agency must agree in writing to abide by ATF's protocols for the network and to enter only testfires and evidence relating to crime guns.

The Evaluation, in section 7.2, refers to ATF's refusal to allow the California Department of Justice to carry out its research inside the working NIBIN database in California; entry of these law enforcement weapons with no relation to crimes would have violated both ATF's appropriations restrictions and the California Department of Justice's Memorandum of Understanding with ATF. In addition, the images entered would have been available for correlation against all new exhibits entered by any agency on the server. Because operations at each agency using the server would have been affected by these additional correlations, such an entry would have required permission from each agency using the server as well as authorization from ATF.

The NIBIN Program's success – and ultimately its usefulness – depend on the cooperation on which it is based. NIBIN partner agencies must continue to enter firearm evidence into the computerized database in the form of test fires and recovered bullets and cartridge casings, and to complete investigative followup of the "hits" generated. As the database grows, the potential increases for identifications to be made, links to crime guns revealed, and investigative leads created. The program is an investigative tool that helps firearms examiners to discover links invisible to other investigative methods. There is no substitute for good police work; efficacy of the NIBIN system depends entirely on the thorough investigation of the intelligence information generated. Cases are closed by investigation of leads generated by NIBIN, not by the system itself.

Evidence for the success of the NIBIN Program is both statistical and anecdotal. Resident in IBIS units throughout 36 States and territories are 119,369 ballistic images of firearms evidence. Entry and correlation of these images (followed by the examination of original

evidence) has generated a total of 4,429 "hits." These hits are significant investigative leads for law enforcement authorities to use in fighting violent crime.

In addition to statistics of the numbers of hits generated by the system, the NIBIN Branch has received much anecdotal evidence of the success of the program, in the form of "success stories" illustrating some of the ways in which NIBIN partner agencies have used the NIBIN system and found great success as a result. They demonstrate how the system can benefit State and local law enforcement agencies and how it can be used most effectively. While each story is different, an element common to many of them is the police department's commitment to entering all evidence from crime scenes and testfired weapons into NIBIN. Routine evidence entry contributes to NIBIN success in two ways: if evidence is entered for every crime, it will be available in the database for comparison to later evidence. Also, the NIBIN system refines its search capability as the database of searched images grows and more images are available for comparison.

Each story also illustrates one of NIBIN's potential benefits to participating agencies. The Houston Police Department has had success in combining NIBIN and crime analysis. Though the Goldsboro, North Carolina Police Department does not have its own NIBIN equipment, its initiative in working with another agency to enter firearms evidence led to solving a string of robberies. The Boston Police Department's policy of mandatory evidence entry led to an amazing 15 investigative leads produced through links to a seized weapon. The New Orleans Police Department combined NIBIN with crime mapping to break a deadly gang's crime spree and put 11 gang members in prison. The NIBIN system's ability to compare results electronically allowed the New York City Police Department and the North Carolina State Bureau of Investigation to identify a potential link six states away.

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V. Technical Issues Raised in the California Department of Justice's Report

a. Issues Relating to Firearms

Different types of firearms

In section 1.1, subpoint 2, the Evaluation asserts that "current systems may not be as efficient for rimfire firearms and are limited to autoloading weapons. Proposed systems will not practically accommodate revolvers, rimfires, certain shotguns and rifles." This statement is incorrect. The IBIS system currently in use by ATF laboratories acquires and correlates all rimfire, center fire, and shotgun ammunition, regardless of what type of firearm discharged it. Due to the absence of cartridge casings at the scene of crimes committed with revolvers, some agencies may choose not to enter it into the IBIS system, but this decision is unrelated to the question of whether or not the IBIS system is equipped to accept such evidence.

Changes in firearms

In section 1.2, the Evaluation states that "firearms that generate markings on cartridge casings can change with use and can also be readily altered by the user." Later, in section 1.5, the Evaluation describes the results of the fourth experiment, saying that "changing the signature of a breech face or firing pin impression for one of the CHP handguns used in this study was a relatively easy affair. The minor alteration required less than 5 minutes of labor to change the signature of the breech face and firing pin. This change is sufficient to make the cartridge case breech face unrecognizable, by IBIS algorithm, to the first set of cartridge cases test fired from that same pistol."

As stated in section I of this report, it is worth noting that while breech face alteration is possible and in fact not difficult, it is also exceedingly rare. One of the senior ATF firearms examiners collaborating on this report has seen only two cases of altered firearms over the course of a 15-year career, and in one of those two cases, the diversion was unsuccessful, as the evidence could still be matched to the firearm despite the alteration. Another examiner, with comparable experience, indicates that over the course of his career, he has seen alteration of a breech face only once: on an examiner proficiency test. These few instances, when compared to the years of experience and the abundance of research indicating that casings can remain identifiable through thousands of firings, seem to indicate that a very low percentage of firearms undergo alteration. Legal and law-abiding gun owners have no particular reason to alter their weapons; yet criminals who might most benefit from doing so don't seem to do it frequently either.

In a crime gun system such as NIBIN, even if alteration occurs, the IBIS technology and the practice of firearms identification remain useful intelligence tools. After alteration, the firearm produces a new set of toolmarks on bullets and cartridge casings expelled from it; it will continue to consistently produce this new set of toolmarks until changed again. Unless

the firearm is re-altered after each use, the new markings will become valuable information for linking the firearm to successive crime scenes and thus helping to solve violent crimes.

The results of the fourth experiment state that after alteration of the breech face, the second set of cartridge casings were "unrecognizable by IBIS algorithm" to the first, yet neglects to mention whether or not a firearms examiner comparing the original evidence would have been able to confirm a match. The IBIS system is intended to function as an initial correlation to alert examiners to potential matches for further examination, and it performs this function in Federal, State and local laboratories nationwide. It is not used, and is not intended, as definitive identification of a match; that is left to the qualified firearms examiner. If the breech face were altered to a sufficient degree, a firearms examiner would not be able to identify a link between the casings; it is not reasonable to expect the system to make identifications that a firearms examiner cannot, and the system's inability to do so is not evidence of a lack of functionality.

If alteration of firearms were as common as the Evaluation implies, the entire profession of firearms identification would be questionable in its utility, yet firearms identification is generally accepted as valid. In the few cases in which it occurs, alteration of a firearm may frustrate an identification by IBIS or by an examiner; however, the IBIS system (and indeed the profession of firearms examination) are still of use in the overwhelming majority of cases in which it does not occur.

b. Issues relating to Ammunition

Choice of ammunition for experiments

The Evaluation describes a number of experiments that were conducted in order to "test" the effectiveness of the IBIS system. There is a glaring methodology flaw in the study design that colors the whole study, the data from that method, and necessarily the purported "results" of the data. That flaw is a fundamental one: the choice (no matter how innocently arrived at) of the brand of ammunition used as a reference database. The results of correlations, the determination of drop-out of candidates in a growing database, the ability for this reference set of casings to "find" other brand matching casings--all of these results are skewed due to the selection of Federal Brand ammunition.

Prior to judgment of the effectiveness of a ballistic system, one of the primary determinations is the choice of ammunition brands and types for the calibers that are planned for entry. Very early in the use of the IBIS technology, it was shown that a proper selection of a "protocol ammunition" gave the best chance overall for those items to find matching evidence bullets and casings in a database. The qualities of such ammunition are basic: the bearing surface of the bullet metal and case primer could not be too hard to get good consistent detail for correlations and later visual examination, yet the ammunition components could not be too soft, as that effect would also give the correlation search a different benchmark to be compared against. This protocol ammunition would be judged as intermediate in recording toolmarks and impression hardness to give the best chance for success.

Unfortunately, Federal brand ammunition was used in the research described in the Evaluation. Federal ammunition is not prescribed by the ATF protocol ammunition in any of the calibers of interest, due to the primer surface generally being too hard in comparison to the ammunition being used in handguns. Understandably, the ammunition was immediately available, but this was a practical logistical decision, not one based on scientific merit, or even examiner experience. A wiser approach in designing the experiments might have been to query experts who had knowledge of such a critical decision, or alternatively, to make a study to determine the best ammunition brand that would be ultimately used in this study.

Therefore, the selection of Federal ammunition was critical to the results of the study, and counterintuitive for a study such as this. The match/ranking results arrived at in this study bear little resemblance to the ATF studies on the same topic conducted using protocol ammunition. If protocol ammunition had been used, it is likely that the match/ranking results would have been much higher. An example of this is the results of the "different brand" test on ranking, which are dramatically lower than past research performed between many calibers. Since the materials used for the study were chosen in contravention of the recommendations of research-based scientific knowledge, many of the results of the studies become questionable, and the conclusions drawn from them dubious.

In subpoint 6 of section 1.1, the Evaluation states that "cartridge casings from different manufacturers of ammunition may be marked differently from a single firearm such that they may not correlate favorably." This is incorrect; a firearm will consistently produce the same toolmarks, making firearms examination and identification possible. While other factors such as the ammunition used can affect the depth to which a firearm makes its marks, such as on a cartridge casing, the marks themselves do not change; rather, the same marks may be shallower on harder cartridge casings and deeper on casings composed of softer metal. This is why ammunition judged to be of intermediate hardness was chosen as IBIS protocol ammunition: to allow the best comparison to a wide range of crime gun evidence. It is worth noting that ammunition difference is not necessarily prohibitive to the discovery of a hit; most of the hits at ATF labs are between evidence from different ammunition manufacturers.

Entry of both bullets and casings

In a discussion of the comparative hit rates for bullets and cartridge casings in the New York Police Department (NYPD) database, the Evaluation states in section 5.4: "Given this hit rate, one must seriously rethink the use of bullets for entry into a database." Yet it is important to consider other relevant factors before reaching this conclusion. Inaccurate comparisons of work on bullets and cartridge casings, such as the statement in section 1.1, subpoint 8, that "fired cartridge casings are much easier to correlate than fired bullets" and dated statistics (used in section 5.4) about the time required to enter and correlate bullets and cartridge casings, lead to potentially inappropriate conclusions about the costs and benefits of bullet entry.

Because markings on bullets and cartridge casings are made by different parts of a given firearm, it is not possible to link a bullet from one crime scene to a casing from another;

matches must be made bullet to bullet and casing to casing. In ATF laboratories, both bullets and cartridge casings are routinely entered into IBIS, and 10% of the confirmed hits at ATF laboratories are from bullet evidence. Because not all crime scenes will have both cartridge casing and bullet evidence, entry of both bullets and cartridge casings allows the maximal opportunity for linkage to another crime and generation of an investigative lead. ATF utilizes both the bullet and cartridge casing entry aspects of IBIS, and we recommend that our NIBIN partner agencies do the same in entering their crime gun evidence.

Factors such as laboratory protocols can affect the hit rate at an individual laboratory, and they must be taken into account in making general conclusions about the IBIS system's effectiveness. For example, the bullet hit rate for the NYPD database may be adversely affected by NYPD laboratory protocols. These protocols mandate the entry of bullets into IBIS only in cases in which cartridge casings are absent; where casings are available for comparison, bullet evidence is ignored. This may reduce the bullet hit rate because some crime scenes have bullet evidence but not casing evidence (drive-by shootings in which the bullets are found at the scene but the casings remain in the shooter's vehicle, for example). Because of this non-entry of bullets, no linkage would ever be discovered from a drive-by shooting case to a case in which both bullets and casings were recovered, because the bullet evidence would not be in the IBIS system for comparison. Given the impact of management decisions on IBIS operations at this laboratory, general conclusions about the usefulness of entering bullets cannot be made from this laboratory's results alone.

The Evaluation also states that "fired cartridge casings are much easier to correlate than fired bullets." It is unclear if the word "easier" is used to mean a reduction in time required for the automated correlation, or an increase in the accuracy of the correlation. Differences in the time required to perform automated correlation of bullet evidence and the time required for automated correlation of casing evidence are negligible, and are unlikely to be noticed by laboratory personnel, for the reasons discussed in the "Correlation Time" section below. The accuracy of a correlation depends on a number of factors, but research has not proven that automated correlation of cartridge casings is more accurate than that for bullets. Review of the original evidence by a firearms examiner does take longer for bullet evidence than for casing evidence, though this is not part of the automated correlation process conducted by the IBIS system.

In making a projection of the number of man-hours required for entry of bullet evidence into the NYPD database, the Evaluation uses an average figure of 84 minutes for preparation, entry, documentation, and review of a typical bullet specimen. This figure is taken from an ONDCP study conducted eight years ago in 1994, and it does not reflect the streamlining in processes and the advances in technology that the IBIS system has undergone in the years since. The examiners collaborating on this report find the time required to be substantially less. IBIS acquisition time will remain constant between agencies, but because each agency's documentation requirements differ, preparatory time will differ widely between agencies.

Subclass characteristics

In section 3.4, the Evaluation engages in extensive discussion of the issue of "subclass characteristics," or characteristics that are common to a group of firearms rather than individual to one firearm, asserting that "these characteristics frequently are misidentified as individual characteristics by the inexperienced examiner when in fact they can belong to a large group of firearms." Later, in a discussion of production marks on breech faces, the Evaluation states that "these breech face marks may look unique and individual when in fact they are not. In an automated imaging system, this would result in a series of false hits." Though such subclass characteristics do exist and are taken into account by firearms examiners, their presence does not negate the usefulness of ballistic imaging and comparison.

Subclass characteristics in themselves can help provide valuable information to investigators. One of the leads that a firearms examiner can provide is a list of possible makes and models of firearms that could have fired an evidence casing or bullet. This is done using class characteristics. Correlation of an exhibit for which the make and model of the firearm is unknown will return a list dominated by a make and model; from this list, it is possible to determine some possible suspect firearms.

No reference is given for the assertion that subclass characteristics "frequently are misidentified," and data or research available to support it would be of interest. The issue of subclass characteristics, and the relation between these group characteristics and the individual characteristics unique to a firearm, has been extensively studied in the firearms examiner community, as reflected in the articles listed below. Whether or not IBIS is used, firearms examiners consider the possibility of subclass characteristics in distinguishing group markings from individual ones, and an abundance of knowledge about the subclass characteristics of specific calibers or ammunition types is available to assist them in doing so.

It should also be noted that even if subclass characteristics proved a distraction to IBIS' automated correlation system, the result would not be "a series of false hits." Hits result from examiner comparison of original evidence, not from IBIS correlation. An examiner with knowledge of subclass characteristics would be able to discern by reviewing the correlation list that the correlation had focused on subclass characteristics. If examination of the original evidence did not prompt the examiner to declare a hit, there would be no hit.

c. Correlation and Database Issues

Correlation time

The Evaluation makes predictions about the size of the projected California database, then applies information about the current IBIS system in the DAS/SAS configuration to reach the conclusion that correlations run on the system will take an hour and a half each (as stated in section 1.5).

The IBIS system has not been static since its introduction, but has been upgraded in keeping with technological advances in the rest of the computer field. For example, between the initial DOS-based version in 1994 and Version 3.2 in 1999, correlation speed for cartridge casings dropped from 35 seconds to 1.7 seconds, and correlation speed for bullets dropped from 4 seconds to 0.3 seconds. The move from the DAS/SAS configuration that the Evaluation describes to the regional server configuration currently being deployed in the NIBIN program has further advanced the processing speed, yielding potentially faster return of correlation results. Given the advances in computer technology and speed of processing that have taken place in recent years, it seems reasonable to anticipate that computer processing will continue to get faster, not that the current processing technology will still be the norm after 5 years.

The discussion of correlation time also makes a fundamental assumption about the work process in a forensic laboratory that is incorrect in the experience of the examiners collaborating on this report. The Evaluation raises the possibility that the firearms examiner will be obligated to wait for results from IBIS, and will be delayed in workload and lessened in productivity as a result. However, in all but the most urgent cases it is unusual for a firearms examiner to proceed through all phases of one case (IBIS entry, correlation, review of results, examination of original evidence) before beginning another. For routine casework it is the norm for examiners to group their work by the type of action required, reviewing IBIS results at a set time each day, for example. Evidence is entered into IBIS by an examiner or technician who then performs other duties while the IBIS system correlates; some time later, the results are reviewed by an examiner or technician; later, the examiner reviews original evidence to confirm a match.

Database uniformity and database size: effect on correlation

Though the Evaluation acknowledges that the experiments it describes "will not reflect, nor are they necessarily relevant, to currently existing databases at the larger agencies" (section 7.1), it still uses their results to make a number of predictions about the behavior of a large database. Among these predictions is the statement in section 1.1, subpoint 7, that "As the database increases in size, there is an increased potential for a firearm type to be over-represented in the database. As progressively large numbers of similarly produced firearms are entered, images with similar signatures should be expected that will make it more difficult to find a link." In describing the conclusions from another experiment, the Evaluation asserts in section 1.6 that "Cartridge cases that are not in rank one may not be detected as the database of similar handguns dramatically increase in size." These statements run counter to ATF's experience in using the IBIS system in its laboratories and deploying it into State and local law enforcement agencies nationwide.

The Evaluation proceeds under the assumption that in a large database, actual hit exhibits will be pushed further down the correlation score list, as if other exhibits had better "matching" detail than the actual "hit." This assumption is not supported by ATF examiners' experience in using IBIS. In actual fieldwork, IBIS correlation scores seem to actually improve with "sister" test casings acquired, as the computer refines its search capability. Research listed at the end of this section describes this effect. In practice, after the correlation of thousands of

exhibits, potential hit candidates can still be found at the top of the list. Thus, the opposite of the Evaluation's statement occurs.

An illustration of this comes from one of ATF's quality control procedures. At each laboratory, a quality control bullet and cartridge casing are entered into IBIS each month, and a correlation is performed. If the assumptions about correlation's relationship to database size were borne out in practice, one would expect that the quality control bullet and casing would correlate less favorably in successive months, as the database became larger; however, the quality control entries are consistently returned as high-confidence candidates, indicating the system's consistency in locating records likely to match.

ATF's experience in using IBIS technology has shown other factors, such as choice of ammunition for testfiring, to be considerably more significant to hit rate. This is particularly apparent in the Evaluation's description of the "different manufacturer" ranking tests; the percentages returned are dramatically lower than those in past research. As detailed elsewhere in this report, the choice of Federal ammunition was an unfortunate one for this research.

Database ownership and security

As the Evaluation notes in section 6.3, ownership of the data and control of the network is a crucial issue for any potential database. The Evaluation, in section 7.2, refers to ATF's refusal to allow the California Department of Justice to carry out its research inside the working NIBIN database in California, but does not make reference to the legal and network-related concerns that prompted this decision. ATF's NIBIN network is constructed expressly for the comparison of crime gun evidence, and permitting entry of these firearms (law enforcement weapons with no relation to crimes) into the working database used for crime guns would have violated both ATF's appropriations restrictions and the California Department of Justice's Memorandum of Understanding with ATF. In addition, the images entered would have been available for correlation against all new exhibits entered by any agency on the server. Because operations at each agency using the server would have been affected by these additional correlations, such an entry would have required permission from each agency using the server as well as authorization from ATF.

d. Other Issues

Laboratory staffing: examiners and technicians

The Evaluation does not accurately state the types of personnel needed to utilize IBIS equipment and the impact of such staffing decisions on the effectiveness of the system. In section 1.1, subpoint 1, the Evaluation states that "Current imaging systems require trained personnel, ideally a firearms examiner, for entry, searching and verification. The use of technicians typically results in higher numbers of false positives that need to be optically confirmed."

In order to operate the IBIS system, training is indeed essential, as it is for most if not all professions in a forensic laboratory. ATF's NIBIN Program provides training to personnel from each laboratory receiving equipment through the program. However, one advantage of the IBIS system over its competitors is that exhibit acquisition does not require a firearms examiner, which is particularly important given the small numbers of firearms examiners available to be hired by forensic laboratories. The most senior technicians can even be trained to do the initial review of correlation results, under supervision from a qualified firearms examiner. Firearms examiners then review the original evidence and confirm a match. Technician review of IBIS correlation results has been the norm in ATF laboratories for the past seven years, and is also in effect in State and local labs using IBIS.

Entry and searching are not necessarily separate operations; the initial IBIS correlation takes place automatically at the close of the entry process. Only additional searches, such as those in another jurisdiction's database of evidence, require separate action by the IBIS operator.

The statement that the use of technicians "results in higher numbers of false positives that need to be optically confirmed" is odd, given that no match is ever confirmed without examination of the original evidence by a qualified firearms examiner. This is true whether the initial IBIS entry was performed by a technician or by an examiner.

Training: examining images

The Evaluation also raises the issue of the training of IBIS users, stating repeatedly that "when examiners are trained on the IBIS system, they are trained to only look at the first 10 ranks" (in section 1.6). This is not an immutable characteristic of IBIS, but a protocol developed from experience in using the system and open to change as the system changes.

In the experience of IBIS practitioners worldwide, the high confidence candidates that are later proven to be hits are generally found within the top 10 candidates; according to FTI figures, a match is found within the top 10 ranked items approximately 97% of the time. Alternative to the instruction to view the top 10 items, trainees are taught that they may look for the "gap" in numerical score between the cluster of highest-ranking items and the next images, and to view all exhibits above this gap. Users are in no way prevented from looking beyond the top 10 if no high-confidence candidate presents itself, or if there are many high-scoring candidates. They are also taught that the multiviewer option allows comparison of multiple images from the same piece of evidence, which can be of great assistance in determining whether or not examination of the original evidence is necessary.

The "top 10" guidance is a protocol developed through the experiences of the systems engineers who designed the IBIS system and the firearms examiners who have used the system successfully for years. If a situation develops such as the one invoked in the Evaluation, of a very large database with many very similar exhibits, and if in this situation the examination of the top 10 potential high confidence candidates proves to be insufficient, additional images can be examined and the protocols changed accordingly.

The definition of a hit

Inconsistencies within the Evaluation in the definition and use of the term "hit" could result in confusion. In a footnote to section 1.1, the Evaluation defines a hit as "a match between two separate case exhibits in a database." Later, in the discussion of subclass characteristics in section 3.4, he states that "In an automated imaging system, this would result in a series of false hits."

ATF's NIBIN Program defines the term "hit" in the following manner:

Definition of a Hit

- A linkage of at least two different crime investigations by the use of the NIBIN technology, where previously there had been no known connection between the investigations.
- A hit is a linkage between cases, not individual pieces of evidence. Multiple bullets and/or casings may be entered as part of the same case record; in this event, each discovered linkage to an additional case constitutes a hit.
- A hit must be confirmed by a firearms examiner examining the actual evidence under a microscope.
- Other NIBIN linkages derived by investigative leads, hunches, or previously identified laboratory examinations, are not "hits" according to this definition. Therefore, other linkages previously termed "warm hits" should not be counted as hits.

This definition differs from those used in the Evaluation in crucial ways. In the citation from section 1.2, it should be noted that under the NIBIN definition, a hit links investigations, not exhibits. This distinction is significant for statistical reasons, as the following example illustrates: finding matches between the three cartridge casings imaged as part of Case A and the two imaged as part of Case B would create five hits (if counting exhibits) or one (if counting investigations). Counting the links between investigations, not exhibits, yields a more accurate representation of the information given to investigators.

The statement that "false hits" would be created by the presence of subclass characteristics on imaged evidence reveals a misunderstanding of the function of the IBIS system. It is vital to understand that IBIS does not and is not intended to generate a "hit," or positive identification. No identifications can be concluded from what is observed on an IBIS monitor. In order to declare a hit, and thus generate information actionable by law enforcement, the original evidence must be examined by a firearms examiner.

Security of evidence; declaration of hits

In section 6.6, the Evaluation engages in an extensive discussion of evidentiary processes surrounding the occurrence of a hit on the database, stating that "The system will not make a hit that is sufficient for law enforcement action. All candidate hits have to be confirmed with optical comparison by an experienced firearms examiner. Only then can police initiate an investigation and search for the registered owner. There could be grave consequences if the police initiate an investigation before an optical comparison of the cartridge case has been

made in the laboratory. Most, if not all crime laboratories by virtue of their strict protocol will be hesitant to or may be forbidden from giving out information based only on a correlated image and not on an actual cartridge examination." These statements are followed by a description of the procedures for evidence transfer between agencies in the event of an interagency hit.

The statement that IBIS high-confidence candidates are not hits until the original evidence is examined by a qualified firearms examiner is entirely accurate. The firearms examiners collaborating on this report know of no qualified examiner or IBIS operators that report a positive identification based upon an IBIS image. In fact, IBIS image or not, no results are reported about any comparison until a proper examination by a qualified examiner has been done. The protocols of the NIBIN network require that information generated by the system not be considered a hit until a qualified firearms examiner has confirmed a match through examination of the original evidence.

The requirement that potential information be verified before it is acted on is not unique to IBIS, and is intended to protect both the public and law enforcement. Other areas of forensic evidence also require definitive confirmation of information, rather than hunch or probability, before law enforcement action can begin. It is true that authorities could encounter adverse consequences if action was taken on a high-confidence candidate that had not been confirmed as a hit, just as they could by acting on a "potential" DNA match before the test results were available or on a seemingly likely match between fingerprints before such a match was confirmed. Restricting law enforcement action to fact, rather than allowing investigators to proceed on likelihood, seems a positive outcome rather than a negative one.

Later in section 6.6, the Evaluation discusses chain of custody and security issues, describing handling, transfer, and other requirements. It is important to note that because of their connection to crime guns, all the cartridge casings and bullets entered into ATF's NIBIN network are considered evidence. Firearms laboratories already have evidence handling procedures in place, and these protocols are followed daily in the laboratories of NIBIN partner agencies nationwide. It is not necessary to employ a new or more restrictive set of protocols for evidence to be entered into IBIS than for evidence of other types. The evidence transfer process described in section 6.6 takes place regularly between NIBIN partner laboratories after an interagency hit occurs.

Firearms and fingerprint evidence

The Evaluation repeatedly draws distinctions between the practice of fingerprint examination and that of firearms and toolmark examination, concluding that the variability of firearms evidence makes it inferior to other types of evidence. For example, it asserts in section 1.1, subpoint 5 that the marks that a firearm leaves on ballistic evidence "…are not permanently defined identifiers like fingerprints and DNA." Later, in section 6.2, the Evaluation states that "…as the database size increases, one will expect to see multiple images that are similar, much like fingerprints. However, the images of cartridge cases are not unique like fingerprints."

Though DNA is not yet alterable by criminals, both fingerprint and toolmark evidence are vulnerable to alteration by the actions of an individual determined to leave no trace of his actions. Just as a determined individual could alter a firearm, a similarly determined individual could alter his fingerprints through the application of acid or by other means. While it is also possible to frustrate the fingerprint identification process through the use of gloves or other hand coverings, there is no way to prevent a firearm used at a crime scene from leaving marks on the bullets and cartridge casings expelled from it. In judging the usefulness of fingerprint or firearms evidence, one must consider not only the feasibility of its alteration but also the infrequency with which this alteration occurs. Research has concluded that in the overwhelming majority of cases (in which no alteration takes place), both toolmarks and fingerprints are useful evidence for criminal cases.

While it is true that both fingerprints and firearms evidence fall into general categories, research has shown the Evaluation's statement that "the images of cartridge cases are not unique like fingerprints" to be incorrect. Just as fingerprints can be grouped into general classifications such as loops and whorls, but they still possess individual characteristics that make them unique, firearms evidence can be grouped into categories, but examination must still reach to the individual level. For example, a firearm's firing pin conforms to one of three basic shapes, and as a result, firing pin impressions on cartridge casings may be sorted by shape into three categories. A piece of evidence in any of these categories is likely to be more similar to other items in its own group than it is to items in another group, yet just as not all fingerprints containing whorls are identical, not all cartridge casings with round firing pin impressions are identical. Other characteristics of the markings on the evidence assist in linking an individual casing to an individual firearm. At the microscopic level at which firearms examination takes place, "similar" and "identical" can look very different indeed.

Fingerprints are analogous to ballistic evidence in another area as well. While initial comparison of fingerprint evidence can take place through the use of automated systems such as AFIS, in order to declare a definitive match between fingerprints, a fingerprint examiner must examine the original evidence. This is similar to the two-step process of automated initial comparison using IBIS and final confirmation by a firearms examiner.

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VI. Conclusion

For several years, ATF has utilized IBIS automated ballistic comparison equipment in its firearms laboratories. This equipment is used to make an initial comparison of new evidence to evidence from previous cases; correlation results provide alerts to high-confidence candidates, enabling examiners to compare the original evidence and declare hits between crimes that could never have been linked otherwise. ATF has also deployed IBIS equipment into State and local NIBIN partner agencies in order to assist them in their efforts against violent crime; through the NIBIN Program, they receive technology that they could likely not afford on their own, as well as the capability to exchange investigative information with other jurisdictions to mutual benefit. Statistics on hits generated, as well as stories of crimes solved, illustrate that these agencies—and the law-abiding Americans resident in their jurisdictions—have benefited from ATF's NIBIN Program.

Many of the objections raised to the IBIS system in the Evaluation can be summarized in the statement that IBIS cannot solve crimes by perfectly producing definitive matches of evidence entered into it. This is a true statement, yet it criticizes the system for its inability to perform actions for which it was never intended and is not used. There is no substitute for human expertise and initiative, in the form of firearms examiners who use their experience and knowledge to declare a hit by examination of original evidence, and in the form of investigators who take the leads generated and use them along with other information in order to solve crimes.

No investigative tool is perfect or will be effective in every situation; this obligates law enforcement to use a variety of techniques for generating investigative leads. The possibility of an "open-case file" of many thousands of exhibits, searchable in minutes instead of the lifetimes that would be required for an entirely manual search, provides an invaluable opportunity to law enforcement, an opportunity that ATF uses to maximum effect through the NIBIN Program.